

# APPLICATION FOR UNITED STATES PATENT

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**Invention:** HOUSEHOLD APPLIANCE

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## SPECIFICATION

## HOUSEHOLD APPLIANCE

The invention concerns a household appliance according to the preamble of Claim 1.

[0001]        The manual dispensing of cleansing agent or detergent using detergent trays in  
5    washing machines or detergent dispensing chambers in dishwashers has long been known in  
commercially available household appliances. As a rule, when this is done, the cleansing  
agent or detergent is in the form of a powder. The disadvantage of this manual dispensing is  
that the appliance user must dispense the exact quantity of cleansing agent, and when so doing  
he also has to take into account how dirty the objects to be cleaned are, the characteristics of  
10    the water, and the selected cleaning program. Such dispensing is required for each cleaning  
process. The user normally does not pay any attention, or not very much attention, to the  
above-mentioned circumstances, on which correct dispensing depends.

[0002]        Also known is the manual dispensing of cleansing agents or detergents in the  
15    form of tablets in detergent trays or detergent dispensing chambers. This has the disadvantage  
that it is possible to dispense the cleansing agent in steps by using one or more tablets. In  
dishwashers, normally only one tablet is dispensed, which has to be designed for the highest  
degree of soiling that occurs, and therefore an unnecessarily large quantity of cleansing agent  
is consumed when the degree of soiling is slight. Due to the large quantity of cleansing agent,  
20    increased attack on the goods to be cleaned should also be expected. Tablet dispensing also  
requires the dispensing of cleansing agent at each cleaning run.

[0003]        Household dishwashers are normally equipped with dispensers to add  
cleansing agent during the washing process. In commercially available dishwashers, such  
25    dispensers have a cleansing agent chamber which is intended to hold a cleansing agent that is  
liquid or solid, for example in the form of a powder or tablet. This cleansing agent chamber is

closed with a cover; a tripping device is provided to open the cover at the programmed point in time through a corresponding control module, for example a control coil. Meanwhile, the washing process is performed by so-called spraying arms, which are supplied by a circulation pump with wash liquid, as a rule water or washing solution, and are driven into rotational motion by the pump pressure. When this happens, the wash liquid comes out through the exit nozzles of the spraying arms, and it is sprayed onto the dirty dishes to clean them.

[0004] These spraying arms have special spray openings at their outer ends, in order to rinse out the opened cleansing agent chamber, to add the cleansing agent to the washing liquid.

[0005] Some such dishwashers allow optional adjustment of the height of the holding basket for the dishes, to adapt its arrangement to the type and size of the dishes to be cleaned. Since the spraying arms are fastened to the bottom of the dish holding basket so that they can rotate, the height of the spraying arms is correspondingly adjusted along with them. However, this can be accompanied by problems with regard to rinsing out the cleansing agent in the dispensing device, which is located at a fixed height, as a rule in the door of the dishwasher.

[0006] In commercially available washing machines, detergent trays are known which are rinsed out by the supply of fresh water. In these machines, the use of solid cleansing agents, in the form of a tablet, for example, presents the problem that the necessary quantity of fresh water is too small to dissolve the cleansing agent completely when it goes through the detergent tray.

[0007] Therefore, the task of the invention is to propose a household appliance, such as a dishwasher or a washing machine, which ensures reliable rinsing out of the cleansing agent chamber(s).

[0008] This task is solved, in a household appliance of the type mentioned at the beginning, by the characterizing features of Claim 1.

[0009]           The measures mentioned in the subordinate claims make possible advantageous embodiments and further developments of the invention.

5    [0010]           Accordingly, in a household appliance according to the invention, the device for adding cleansing agent is connected with a pressure line of a rinsing pump to deliver liquid to the addition device. This makes it possible, by operating the rinsing pump, to continue to rinse out the cleansing agent with the necessary pressure until the required quantity of cleansing agent has been rinsed out. This rinsing out is independent of the quantity  
10 of fresh water required by the household appliance.

[0011]           A special embodiment of the invention involves connecting the suction line of the rinsing pump with a liquid reservoir. Such a liquid reservoir can be realized in the form of a fresh water tank, for example, which is filled with a sufficient volume of liquid independent  
15 of or during the delivery of fresh water for the cleaning or washing process.

[0012]           However, a preferred embodiment involves connecting the suction side of the rinsing pump with the system of lines for the cleaning liquid used for the functional cleaning of laundry, dishes, etc., which is present anyway. Here it is advantageous for the suction line  
20 of the rinsing pump to be connected with the machine's sump, i.e., the bottom area of the machine interior, where the cleaning liquid collects during the operation of the machine.

[0013]           If appropriate, a separator and/or filter unit can be provided before the adding device, in order to remove dirt components from the cleaning liquid, which under some  
25 circumstances is contaminated during the cleaning process, so that the device for adding cleaning agent is not contaminated by the use of dirty wash liquid to rinse out the cleansing agent.

[0014]           Many household appliances use a circulation pump to circulate the cleaning  
30 liquid. An especially advantageous embodiment of the invention now involves simultaneously

using this circulation pump as a rinsing pump for the addition unit. This saves the cost of a separate rinsing pump.

[0015] When a circulation pump is used as a rinsing pump, in theory it is possible for the entire flow of cleaning liquid to be passed through the addition unit. However, it is preferable for only a partial flow of cleaning liquid to be branched off from the cleaning liquid circuit to rinse the addition unit. This has the advantage that the liquid throughput of the addition unit can be selected independently from the total volume of the circulated flow. Moreover, such a partial flow can be taken from the entire circuit during operation of the household appliance, i.e., during the cleaning process, which shortens the duration of the program.

[0016] It is advantageous to connect an on-off valve, to make it possible to choose when the addition unit is connected with the liquid circuit of the cleaning unit. Such an on-off valve makes it possible to trigger the process of rinsing the addition unit and stop it again while the other operating functions of the household appliance are running.

[0017] It is advantageous if a control unit is also provided which can dispense a partial quantity of the cleansing agent located in the addition unit, for example the detergent tray or dispensing chamber.

[0018] This control unit makes it possible to put a larger advance supply of cleansing agent in the household appliance than is necessary for one program step. Accordingly, dispensing no longer involves measuring the quantity of cleansing agent as it is put in, but rather is handled by a control unit which adds to the cleaning process a desired portion of the entire quantity of the cleansing agent located in the addition unit.

[0019] In an advantageous embodiment of the invention, the control unit includes an on-off valve which is arranged in the liquid inlet to the addition unit. This makes it possible for the control unit to control the delivery of the liquid provided for rinsing out the cleansing

agent, and thus also the quantity of cleansing agent delivered to the cleaning process.

[0020] In a special embodiment of the invention, the dispensing unit also includes a control unit for time-dependent switching of the control valve. This embodiment represents an especially simple sample embodiment of the invention, since the control unit needs only one timer to control the dispensing of the partial quantity in a time-dependent manner. A further development of this embodiment might involve providing an additional data memory which has corresponding means of input and which can store the values of other variables that are needed to determine the necessary dispensing time. This makes it possible to input and store information about the water quality and/or the type of cleansing agent, etc., for example, so that the control unit can take it into consideration when dispensing the cleansing agent.

[0021] In another embodiment of the invention the dispensing unit includes a flowmeter for quantity-dependent switching of the on-off valve. In this way, the cleansing agent is dispensed indirectly by measuring the quantity of liquid used to rinse out the cleansing agent and using this as a measure of the cleansing agent dispensed. Such an embodiment is especially advantageous if the supply of fresh water to the household appliance is connected to the cleansing agent addition unit. In many commercially available machines the fresh water inlet already includes such a flowmeter, so that if fresh water is used to dispense cleansing agent, its quantity can be measured with the existing components, without additional expense.

[0022] In a further development of the invention the dispensing unit also includes a temperature sensor so that the temperature of the liquid used to rinse out the cleansing agent, and possibly that of the cleansing agent itself, can be taken into consideration when the partial quantity to dispense is determined from the measured quantities such as, for example, the quantity of liquid rinsed through, the type of the cleansing agent, etc.

[0023] In order to determine the partial quantity to dispense from the values of various parameters, such as temperature, type of cleansing agent, quantity of liquid, etc., it is

advantageous for the control unit to have an arithmetic logic unit, in order to make it possible to compute the partial quantity.

[0024] A specific embodiment of the invention includes a concentration sensor to  
5 measure the quantity of cleansing agent rinsed out in the liquid used for this purpose. This makes it possible to measure the partial quantity to be dispensed directly, and thus more precisely, by taking into consideration the entire quantity of liquid used to rinse it out.

[0025] In a preferred embodiment of the invention, the concentration sensor is made  
10 or arranged in such a way that it can be used to produce the concentration of cleansing agent in the cleaning liquid provided for the cleaning process in the household appliance. Therefore, in this embodiment it is not the magnitude of partial quantity to be dispensed that is measured, but rather the concentration of the cleansing agent in the washing solution, as it is used on the objects to be cleaned, so that during dispensing the quantity of the cleaning liquid used for the  
15 washing process is also taken into consideration, and thus here again it is possible for the dispensing of the partial quantity to be more precise and appropriate.

[0026] A concentration sensor can be realized in the form of the most various  
currently known or future concentration sensors. In an embodiment which can be realized  
20 with little expense, the concentration sensor is in the form of a conductance sensor. Such a conductance sensor can be realized by an especially simple design in the form of two or more electrodes, which project into the liquid to be measured. From the conductance direct conclusions can be drawn about the concentration of the cleansing agent.

[0027] In an especially advantageous further development of this embodiment, such a  
25 concentration or conductance sensor has other functions. Thus, it can be used, for example, to measure the water hardness of fresh water as well as that of prepared soft water coming from the ion exchanger. It is also possible to measure the capacity or loading status of the ion exchanger through a conductance sensor; the same sensor can be used as a concentration  
30 sensor for the dispensing of cleansing agent according to the invention. Possibly the same

components, or at least some of the same components, can be used for operating various conductance sensors which are arranged at different places for the same function or a different one. Such components can be electronic units for taking measurements, for example amplifiers or similar devices, or computer systems for determining the desired final result  
5 from the raw data obtained by measurement.

[0028] A sample embodiment of the invention is shown in the drawing, and is explained in detail below using the figures.

10 [0029] The figures are as follows:

Figure 1 is a schematic diagram of a first embodiment of the invention;

15 Figure 2 is a schematic diagram of a second embodiment of the invention;

Figure 3 is a schematic diagram to show how the liquid is routed in a dishwasher according to the invention; and

20 Figure 4 is a schematic diagram of another embodiment of the invention.

[0030] The schematic diagram in Figure 1 shows the cleaning liquid circuit 1 for the cleaning process in a dishwasher. A circulation pump 2 supplies a spraying arm 4 through a line 3 that is connected to the pump's delivery side. Such spraying arms 4 are normally  
25 arranged on two or more levels in dishwashers, and are mounted there so that they can rotate. Floor 5 of the dishwasher forms the so-called sump, which is connected, through a line 6, with the suction side of circulation pump 2. The cleaning liquid is circulated through the circulation pump 5 until the desired cleaning program is completed.

30 [0031] Here the delivery-side line 3 has a bypass line 7 arranged on it, which is



connected through an on-off valve 8 to an addition unit 9 to add cleansing agent to the cleaning process.

[0032] A sensor 10 takes measurements to determine the properties of the cleaning liquid, in particular the cleansing agent concentration. Sensor 10 can be a conductance sensor, for example. The measurements are transferred to control unit 11 and used to dispense cleansing agent.

[0033] Accordingly, bypass lines 7, on-off valve 8, addition unit 9, sensor 10, and control unit 11 form components of a dispensing unit 12 to dispense a partial quantity of the cleansing agent located in addition unit 9.

[0034] In the sample embodiment shown in Figure 2, circuit 1, i.e., circulation pump 2, line 3, spraying arm 4, floor 5, and suction side line 6 corresponds to the previously mentioned sample embodiment. However, here a reservoir 15 is also to be filled through the fresh water connection, for example by rinse water passing through an open-air path or a direct connection. Reservoir 15 is emptied through a rinsing pump 16, whose suction line 17 projects into the area of the floor of reservoir 15. Rinsing pump 16 supplies addition unit 13 with liquid to rinse out the cleansing agent located there.

[0035] Figure 3 schematically shows the structure of a special embodiment of the cleansing agent dispensing according to the invention in a dishwasher. During the cleaning cycle, cleaning liquid on the floor of the machine container is sucked out of cleaning space 18 and distributed through delivery line 19 and one or more spraying arms 20 over the items being washed (not shown). The preferred cleaning liquid to use is water, which is admitted into cleaning space 18 before the actual cleaning starts.

[0036] In order to increase cleaning power, the water must have cleansing agent added to it. This is done according to the invention by directing a partial flow of circulated cleaning liquid through valve 21 and line 22 into a cleaning agent reservoir chamber 23, which

contains an optional sieve-like container 24 inside to hold cleansing agent 25. When cleansing agent 25 makes contact with the cleaning liquid, it is slowly at least partially dissolved, and the cleaning liquid enriched with cleansing agent runs through line 26 back into the dishwashing machine. Line 27 serves only as an overflow safety, in case line 26 should be plugged.

[0037] To control the concentration of cleansing agent in the cleaning liquid, a measurement is performed in measurement chamber 28 of the state of the cleaning liquid, e.g., through a conductance measurement. Since the conductance of the cleaning liquid is directly proportional to the concentration of cleansing agent, controller 29 can close valve 21 if the concentration of cleansing agent exceeds a certain value. The intrinsic conductivity of the water without cleansing agent in it can be measured at the beginning of the dispensing of cleansing agent and be taken into consideration in controlling the dispensing of cleansing agent.

[0038] Cleansing agent 25 can be used in the form of a solid body, e.g., a pressed block, from which the necessary partial quantities of the cleansing agent are gradually dissolved or separated in fragments. The quantity or volume of cleansing agent 25 can be designed in such a way that the total quantity is sufficient for several cleaning cycles.

[0039] Figure 4 shows another, somewhat more detailed variant of the invention. Some elements that are comparable with elements according to the preceding figures are given the same reference numbers. Spraying arm 4 or spraying system 4 is supplied, by means of pump 2 through line 3, with water and/or cleansing agent. This can be water collected on floor 5 or water with cleansing agent added to it.

[0040] Pump 2 has a filter or sieve 30 downstream of it, e.g. in bypass segment 7, so that at least some of the dirt from the washing chamber can be held back. Some parameters, e.g., temperature, conductance, etc., of the partial quantity branched off in bypass line 7 are measured by means of a measurement system 31. The measured parameters are passed on to

controller 32 that controls, among other elements, valves 33, 34, which can dispense cleansing agent or dishwashing detergent to the washing chamber of the household appliance by delivering a defined quantity of liquid into dispensing chambers 35, 36.

5 [0041] For example, a dispensing unit 38 includes chamber 35 for clear rinse, chamber 36 for the main wash cycle, and chamber 37 for the prewash cycle. The dispensing unit 38 shown in Figure 4 is designed in such a way that chambers 35, 36 normally contain a supply of a solid cleansing agent, e.g., in the form of a block for several cycles, and chamber 37 contains a supply of liquid cleansing agent. The liquid cleansing agent is advantageously  
10 dispensed into the washing chamber with the help of gravity and a valve 39 controlled by a central control unit 42. As has already been partly described above, solid cleansing agent is dispensed with the help of the liquid stream controlled by controller 32. Chambers 35, 36 and/or bypass 7 might include one or more heaters to heat the branched off part of the dispensed liquid.

15 [0042] In particular, to dispense cleansing agent or wash solution, dispensing unit 38 includes an outflow 40. Moreover, a rinsing line 41 is provided to rinse out or deliver cleansing agent or rinse solution from dispensing unit 38. Rinsing line 41 might also include a controllable valve.

20 [0043] Central control unit 42 is connected not only with line 44 to transmit control signals for the prewash cycle, but in particular is also connected with the controller 32 through lines 45, 46 to transmit control signals for the main cycle or the clear rinses. Depending on the respective operating phase, controller 32 controls valves 33, 34 through  
25 lines 49, 50. Controller 32 includes one or more input or adjustment devices to adapt it to different cleansing agents or dishwashing detergents, hardness of the untreated water used, etc. In a special variant of the invention, controller 32 can be completely integrated in central controller 42.

30 [0044] The schematic diagrams shown illustrate several examples of how the

invention can be realized. Independent of what variables are measured and how they are used to determine the parameters necessary for dispensing the partial quantity, the invention is implemented whenever a partial quantity of the cleansing agent located in an addition unit in a household appliance such as a washing machine or a dishwasher is dispensed for the washing process.

[0045] As described above, it is also conceivable to take other data or measured variables into consideration, for example the nature of the cleansing agent, the temperature of the liquid, that is used for rinsing out the cleansing agent, the desired wash program, the degree of soiling of the objects to be cleaned, the pressure available to rinse out of the cleansing agent, etc.

List of Reference Numbers:

	1	Circuit
	2	Circulation pump
5	3	Line
	4	Spraying arm
	5	Floor
	6	Line
	7	Bypass line
10	8	On-off valve
	9	Addition unit
	10	Sensor
	11	Control unit
	12	Dispensing unit
15	13	Addition unit
	14	Fresh water connection
	15	Reservoir
	16	Rinsing pump
	17	Suction line
20	18	Cleaning space
	19	Delivery line
	20	Spraying arm
	21	Valve
	22	Line
25	23	Cleansing agent reservoir chamber
	24	Container
	25	Cleansing agent
	26	Line
	27	Line
30	28	Measurement chamber
	29	Control unit
	30	Sieve
	31	Measurement system
	32	Control
35	33	Valve
	34	Valve
	35	Chamber
	36	Chamber
	37	Chamber
40	38	Dispensing unit
	39	Valve
	40	Outlet
	41	Line

	42	Controller
	43	Line
	44	Line
	45	Line
5	46	Line
	47	Adjustment
	48	Adjustment
	49	Line
	50	Line
10		